

## AMENDMENTS TO THE SPECIFICATION

The following is a marked up version of each replacement paragraph and/or section of the specification in which underlines indicate insertions and strikethrough or double brackets indicate deletions.

On page 2 of the specification, please replace paragraph [0003] with the following paragraph:

**[0003]** The inventors have discovered that planning a shutdown and reshuffle process into the initial operating plan of a nuclear reactor core may provide the beneficial result of increased energy output and thus increased revenue over operating plans with no shutdown and shuffling process. Such planned outage could also be utilized to mitigate any unanticipated issues that might occur during the cycle. Such issues may include: failed fuel, or equivalently, a 'leaking' fuel rod; channel bow, a deformation of the fuel bundle channel due to non-uniform bundle exposure; and excess control blade history - a well-known nuclear reaction induced phenomenon that can limit the thermal performance of the controlled bundles in the current and subsequent fuel cycles. Mitigation of such problems will proactively improve plant performance with regard to energy produced and plant availability.

On page 22-23 of the specification, please replace paragraph [0057] with the following paragraph:

**[0057]** FIGURE 9 illustrates a flow chart of the method of improving reactor performance through in-cycle shuffling according to an embodiment of the present invention. For the purposes of explanation only, the method of improving reactor performance through in-cycle shuffling according to FIGURE 9 will be described as being implemented by the architecture illustrated in FIGURE 1B. As shown, in step S30 an initial operating plan is developed as discussed in detail above. However, this initial operating plan is developed knowing a priori that and in-cycle shut down and shuffling operation will take

place. In this situation, the initial operating strategies developed in step S30 may differ from typical historical concepts. For example, an operating plan designer may target less operating margin for the part of the cycle following the in-cycle shuffle. Because the loading and rod pattern strategy may be modified at the time of the in-cycle shuffle, additional operating margin may be included during the in-cycle shuffle development. A user then models operation of the nuclear reactor core (also referred to as "core" and "reactor core" in this disclosure) to a user selected in-cycle shut down point such as mid-cycle in step S32. Namely, the user runs a well-known simulation program on the developed core design to simulate operation up to the in-cycle shut-down point. Depending on the results of the simulation, the user may decide to re-run the simulation for a different in-cycle shut-down point. Factors that would influence the time of the in-cycle shuffle would be the expected price of energy at the time of the in-cycle outage, the availability of the outage crews (some utilities own multiple reactors that utilize the same outage crew), etc. Step S32 may be performed at any point in time prior to the user selected in-cycle shut-down point provided sufficient time is available to license and implement the new operating plan based on shuffling the core as explained in detail below. For example, step S32 may be performed by the user prior to actual implementation of the core design in the reactor or sometime after the reactor has been operating according to the core design.